2. In response to the reasons cited by the examiner for claim rejections, Applicant has amended claims 1 through 16 as claims 1 through 10. Specific details follow.

3. Claim 16 was rejected under 35 U.S.C. 112, "the vessel" lacks antecedent basis. Claim 16, as amended, is now a part of claim 9, and "a vessel" provides antecedent basis for "the vessel". This claim should now be in allowable form.

4. Claims 1 and 2 were rejected under 35 U.S.C. 102(b) as being anticipated by Netzer or Larson. Claims 1 and 2 of the application have been amended as claims 1, 2, and 3 of the Application, as amended.

Claim 1 of the Application, as amended, claims a capacitive sensor wherein, "...at least two coplanar electrical conductors attached to a substrate and electrically insulated from one another, the conductors separated from one another by spacing, the spacing equal to at least two times the thickness of the dielectric wall, the conductors forming a fringing field capacitance, ...". Thus, the present invention utilizes conductor spacing, and other geometrical constraints, to achieve a desirable increase in sensitivity to the measured fluid as compared to an undesirable sensitivity to the dielectric material between the conductors, to the dielectric wall of the vessel, as well as to minimize other properties of the dielectric wall, such as temperature sensitivity of its dielectric constant, contamination, or splashing of the fluid onto it. This is contrary to the teaching of Netzer, in which an alternative method is taught to attempt to achieve a reduction in sensitivity to contamination or splashing. In column 10, line 51, Netzer teaches additional conductor(s) 405, to be utilized and grounded "...to minimize the effects of contamination and splashes...".

In Larson. column 4, line 49, differentiator means is taught for the purpose of measuring the level of liquid 31, so that the "The capacitive component of the liquid adhering to the walls of tank 11 will be extremely small compared to the capacitance of the bulk liquid 11...". This is contrary to the teaching of the present Application, in which sensitivity to splashing of the fluid onto the vessel wall is minimized through controlling geometric constraints, such as conductor spacing.

Netzer does not teach or claim a desirable spacing between conductors 402-405. Figure 2 shows that an electromagnetic field penetrates into the measured liquid, but any arrangement of electrodes energized by an alternating electromagnetic field will accomplish this to some degree. And in fact, the apparent dimensions shown in figure 2, with d obviously much smaller than D, are contrary to the present Application. The present Application, claims a spacing of at least two times the thickness of the dielectric wall (in claim 1, as amended).

Likewise, Larson does not teach or claim a desirable spacing between conductors.

Therefore, in their present form, as amended, claims 1 and 2 should now be in allowable form.

5. Claim 3 was rejected under 35 U.S.C. 102(b) as being anticipated by Larson. This is now claim 4 in the present Application, as amended.

In Larson, a portion of the dielectric material 11 is shaped such that a depression is formed in the surface of the sensing element facing the fluid 31 (Fig. 2A). In Larson Fig. 2A, the depression cited forms what is called the vessel in the present Application, for containing the fluid to be measured. Conductors 12 and 13 in Larson Fig. 2A oppose each other with the measured liquid in-between. This constitutes a uniform field capacitance sensor, with the measured liquid filling the cited depression.

In claim 4 of the present Application, as amended, the conductors are coplanar and attached to a substrate, forming a fringing field capacitance sensor, with the coplanar conductors separated by spacing. A gap is formed in the surface of the substrate, such as gap 26 in figure 12, for example. This gap avoids the presence of at least a part of the substrate material between the conductors, and serves to reduce the starting capacitance of the sensing element, thus increasing the sensitivity to the measured liquid.

Thus, it can be seen that the depression cited in Larson figure 2A, is not similar to the "opening, gap, or depression" of the present Application, as amended.

Claim 4 (replacing the previous claim 3) should now be in allowable form.

6. Claims 4, 5, 7, 12 and 15 were rejected under 35 U.S.C. 102(b) as being anticipated by Netzer.

Claim 4 is cited by the examiner as being anticipated by the flexible plastic sheet of Netzer. In the present Application, the original claim 4 is now claim 6, as amended. In claim 6, as amended, the main usefulness of the flexible sensing element is due to the geometric configuration of the widths and spacing of the conductors, and compared to the thickness of the dielectric wall. This allows a flexible sensor with a simple electrode configuration to be fabricated inexpensively. In order to achieve the more complicated three-electrode (402-404) sensor configuration of Netzer, along with the addition of ground lines 405 that are needed to see through a dielectric wall, and printed conductive carbon, a resulting flexible sensing element will be more expensive and prone to damage from flexing, as compared to the simple design of the present Application.

(Claim 4), now claim 6, as amended, of the present Application, depends on claims 1 and 2, and should now be in allowable form.

Claim 5 was rejected by the examiner because Netzer's sensing element has a configuration that allows it to be cut to length. Applicant has deleted the original claim 5 of the application.

Claim 7 was rejected because Netzer teaches a grounded shield parallel to the sensing element. The shield of Netzer, however is taught to be on the opposite side of a substrate on which the sensing conductors are formed on the opposite face. This is contrary to the

teaching and claims of the present Application. Fringing field sensors according to Netzer are formed either "on a thin non conductive substrate" column 4, line 1 (such as a typical printed circuit board construction), or "a flexible plastic sheet, such as Mylar" column 9, line 53. But in fact, according to experiments by the present inventor before preparation of the application, use of such a relatively thin dielectric layer between the conductors and the shield drastically reduces the usefulness of the sensor by greatly increasing the starting capacitance.

According to the present invention and Application, conductor width and spacing required for improved sensitivity are also relative to the distance between the sensing conductors and the measured liquid (usually through a dielectric wall). Preserving this improved sensitivity while applying a shield requires a spacing to be maintained between the conductors and the shield, and any material within that spacing must be of a low dielectric constant, such as a foamed dielectric material as taught in the present Application.

Claim 7 of the application is now claim 8, as amended. Claim 8, as amended, depends on claims 1 and 7. For the reasons cited above, Claim 8 in its amended form does not read on Netzer, and should now be in an allowable form.

Claims 12 and 15 were rejected due to similar teachings by Netzer. Applicant has amended the application to delete claims 12 and 15.

7. Claim 6 was rejected under 35 U.S.C 103(a) as being unpatentable over Netzer in view of Koon. Claim 6 has been deleted from the application, as amended.

8. Claims 8, 9, 11, 13, 14, and 16 were rejected under 35 U.S.C 103(a) as being unpatentable over Netzer in view of Koon.

Applicant has deleted claims 11, 13, 14, and 16 of the original application.

Claim 8 of the application has been amended to specify the features that provide improved sensitivity, and is now included as claims 9 and 10 in the Application, as amended, and as described below.

Claim 9 has been amended to specify the relationship of the coplanar conductor widths and spacing of a fully embedded sensing element. Rather than being a simple and efficient means for monitoring fluid level, as cited by the examiner, the Application teaches a preferred geometrical configuration of the conductor widths and spacing, such that an embedded sensing element will have improved sensitivity to the measured liquid.

As amended, claim 9 should now be in allowable form.

9. Claim 10 was rejected under 35 U.S.C 103(a) as being unpatentable over Larson in view of König. Applicant has deleted claim 10, and replaced it with a claim 10 that

depends on claim 9, and further specifies features that provide improved sensitivity of an embedded sensor. Claim 10 should now be in allowable form.

Applicant's Request

Reconsideration of the Application as amended and allowance thereof are requested. Appendix A is enclosed as a copy of the complete Application, as amended. In commenting on the references and in order to facilitate a better understanding of the differences that are expressed in the claims, certain details of distinction between the references and the present invention have been mentioned, even though such differences do not appear in all of the claims. Not all of the distinctions between the Prior Art and Applicant's present invention have been made by the Applicant. For these reasons, Applicant reserves the right to submit additional evidence showing the distinction between Applicant's invention and Prior Art to be unobvious in view of the Prior Art.

The foregoing remarks are intended to assist the Office in examining the Application and in the course of explanation may employ shortened or more specific or variant descriptions of some of the claim language. Such descriptions are not intended to limit the scope of the claims; the actual claim language should be considered in each case. Furthermore, the remarks are not to be considered to be exhaustive of the facets of the invention which are rendered patentable, being only examples of certain advantageous features and differences which Applicant chooses to mention at this time.

Respectfully submitted,

David S. Nyce
2633 Whistling Quail Run
Apex, NC 27502